WAN Module Installation and User Guide

(Includes WM-4T1i Module Installation and User Guide)

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Preface

This Preface provides an overview of this guide, describes guide conventions, and lists other publications that may be useful.

Introduction

This guide provides the required information to install the WM-4T1i, WM-4E1i, and WM-1T3i WAN modules in an Alpine 3800 series switch from Extreme Networks and perform the initial module configuration tasks.

This guide is intended for use by network administrators who are responsible for installing and setting up network equipment. It assumes a basic working knowledge of:

- Local area networks (LANs).
- Ethernet concepts.
- Ethernet switching and bridging concepts.
- Routing concepts.
- Internet Protocol (IP) concepts.
- Routing Information Protocol (RIP) and Open Shortest Path First (OSPF).
- Simple Network Management Protocol (SNMP).

If the information in the release notes shipped with your module differs from the information in this guide, follow the release notes.

Terminology

When features, functionality, or operation is specific to one of the WAN modules, the specific module name is used. Explanations about features and operations that are the same for both of the WAN modules simply refer to the product as the “module.”

Conventions

Table 1 and Table 2 list conventions that are used throughout this guide.

Table 1: Notice Icons

Icon	Notice Type	Alerts you to...
	Note	Important features or instructions.
	Caution	Risk of personal injury, system damage, or loss of data.
	Warning	Risk of severe personal injury.

Table 2: Text Conventions

Convention	Description
`Screen displays`	This typeface indicates command syntax, or represents information as it appears on the screen.
`Screen displays bold`	This typeface indicates how you would type a particular command.
The words “enter” and “type”	When you see the word “enter” in this guide, you must type something, and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says “type.”
[Key] names	Key names are written with brackets, such as [Return] or [Esc]. If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press [Ctrl]+[Alt]+[Del].

Table 2: Text Conventions (continued)

Convention	Description
Words in *italicized* type	Italics emphasize a point or denote new terms at the place where they are defined in the text.

Related Publications

The publications related to this one are:

- ExtremeWare™ release notes
- *ExtremeWare Software User Guide*
- *Alpine 3800 Series Switch Hardware Installation Guide*
- *Alpine Module Installation Note*

Documentation for Extreme Networks products is available on the World Wide Web at the following location:

http://www.extremenetworks.com/

1 Installing the WAN Module

This chapter covers the following topics:

- Installing the WAN Module on page 1-2
- Ports and Connectors on page 1-3
- Module LEDs on page 1-4
- Installing the WAN Module Software on page 1-6

Overview

The Extreme Networks WAN modules include four-port T1 or E1 modules that can be configured to use Multilink PPP to aggregate Ethernet or IP routed traffic across multiple T1/E1 physical links. The modules also have two general purpose 10/100 Mbps Ethernet ports. WM-4T1i is the designation of the T1 version, and WM-4E1i is the designation of the E1 version. Also included among the WAN modules is a one-port T3 module, designated WM-1T3i, that uses PPP for its traffic.

The modules also have eight internal loopback ports. The Alpine 3800 switch modules have hardware queues associated with the output of each port for QoS (rate shaping and priority queueing). To implement ingress QoS, you needed to use the hardware queues associated with a second port as a loopback port for ingress QoS.

Installing the WAN Module

All Alpine ™ 3800 series switch module cards (SMMi modules and I/O modules) are hot-swappable. You do not need to power off the system to remove or insert a module card.

Caution: Service to Alpine modules should be performed by trained service personnel only. Before installing or removing any components of the system, or before carrying out any maintenance procedures, read the safety information provided in Appendix A of the Alpine Hardware Installation Guide.

Warning: You must install blank panels in empty slots to ensure adequate system cooling.

To remove and replace a module card, follow these steps:

1 Prior to removing/installing a module card into the Alpine 3804 or Alpine 3808 chassis, put on the ESD wrist strap that is provided with the chassis, and connect the metal end to the ground receptacle located on the top-right corner of the Alpine front panel.

2 Loosen the module card by unscrewing the screws using a #2 Phillips-head screwdriver.

3 Rotate the ejector/injector handles to disengage the module card from the backplane.

Note: Blank panels do not have ejector/injector handles, because they do not engage the backplane. They are secured entirely by the retaining screws. In addition, the retaining screws are not captive.

4 Slide the module card out of the chassis.

5 Slide the new module card into the appropriate slot of the chassis (SMMi modules into the orange slot, I/O modules into Slots 1 through 4 on the Alpine 3804, or Slots 1 through 8 on the Alpine 3808), until it is fully seated in the backplane.

Caution: Ensure that the sheet metal of the module, and not the PCB board, engages the card cage runners.

As the module begins to seat in the chassis, the ejector/injector handles will begin to close.

6 To secure the module in the chassis, close the ejector/injector handles by pushing them toward the center of the module card, and tighten the screws using a #2 Phillips-head screwdriver.

Note: Tighten the screws before inserting additional modules. If you insert additional modules before tightening the screws, you might unseat modules that you have not secured.

Caution: You can only install I/O modules in the slots labeled Slot 1 through Slot 4 on the Alpine 3804, or Slot 1 through Slot 8 on the Alpine 3808. Forceful insertion can damage the I/O module and the connector pins on the backplane.

Ports and Connectors

The WM-4T1i module is shown in Figure 1-1.

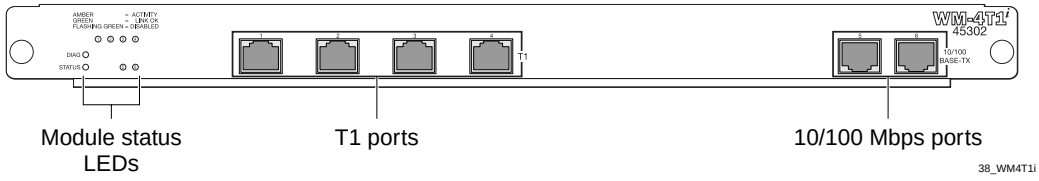


Figure 1-1: WM-4T1i Module

The WM-4T1i module has four T1 ports and two general purpose 10/100 Ethernet ports. The WM-4T1i also has eight internal loopback ports. Internal loopback ports allow you to configure bi-directional rate-limiting without tying up any of the external ports for ingress rate shaping. Internal loopback ports are marked with the notation “iL” when displayed on the command line or with ExtremeWare Vista Web access.

The WM-4E1i module has four E1 ports in place of the T1 ports found in the WM-4T1i module. It is identical in all other respects.

The WM-1T3i module is shown in Figure 1-2.

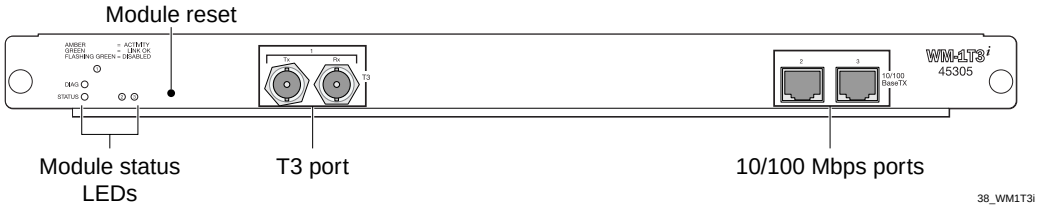


Figure 1-2: WM-1T3i Module

The WM-1T3i module has one T3 port, consisting of a two BNC connectors, one for the transmit path and one for the receive path. The module also has two general purpose 10/100 Ethernet ports. Like the other WAN modules, the WM-1T3i also has eight internal loopback ports.

Module LEDs

The T1/E1 module LEDs are shown in Figure 1-3. The WM-1T3i module LEDs are similar, but there is only one WAN port LED and the Ethernet port LEDs are numbered 2 and 3.

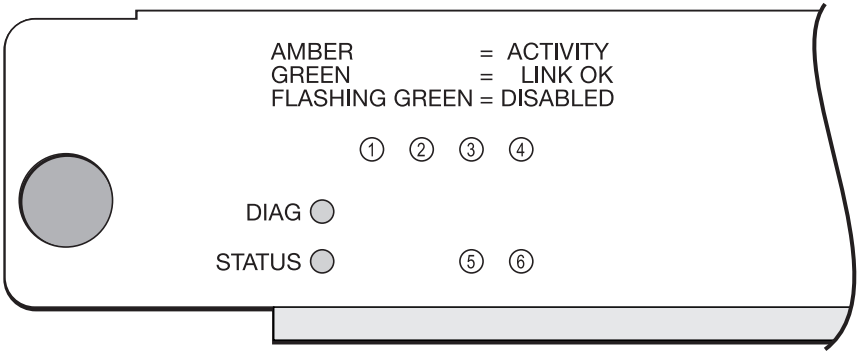


Figure 1-3: T1/E1 Module LEDs

Table 1-1 describes the LED behavior on the WAN modules.

Table 1-1: WAN Module LEDs

LED	Color	Indicates
Status	Off	No power
	Amber	Module seated in chassis
	Green	Module powered up
Diag	Green (blinking)	Power-on Self Test (POST) is running
	Off	Normal operation
WAN port (1-4)T1/E1 (1)T3	Amber	Near-end fault detected (for example, no cable)
	Amber (blinking rapidly)	Far-end fault detected
	Amber (blinking slowly)	Physical link present, but no higher-layer link established
	Green	Physical link present, higher-layer link established, no traffic
	Alternating green and amber	Physical link present, higher-layer link established, traffic present
	Green (blinking slowly)	Port disabled or unconfigured
	Green (blinking rapidly)	Loopback testing mode
10/100 port (5,6)T1/E1 (2,3)T3	Off	No link present
	Green	Link present
	Alternating green and amber	Traffic present

The slowly blinking LEDs cycle once per second. The rapidly blinking LEDs cycle twice a second.

Installing the WAN Module Software

Once the WAN module is installed in the chassis, you might need to update the image file on the module. See the release notes for your version of ExtremeWare for details. (You might also need to update the image on the SMMi to one that will support the module. See the *ExtremeWare Software User Guide* for more information on updating the SMMi image.)

The image file contains the executable code that runs on the module. As new versions of the image are released, you should upgrade the software running on your module.

The image installed on the SMMi and the image installed on the module must be compatible. New SMMi images and module images are released together, so if you upgrade both at the same time, you will be certain to have compatible images. If this is not feasible, see the Extreme Networks customer support website for compatibility information.

The image is downloaded from either a Trivial File Transfer Protocol (TFTP) server on the network or from a PC connected to the serial port using the XMODEM protocol. Downloading a new image involves the following steps:

- Load the new image onto a TFTP server on your network (if you will be using TFTP).
- Load a new image onto a PC (if you will be using XMODEM).
- Download the new image to the module using the command

  ```
  download image slot <slot> [<ipaddress> | <hostname>] <filename>
  {primary | secondary}
  ```

  where the following is true:

  `slot` — Is the slot in which the module is installed.

  `ipaddress` — Is the IP address of the TFTP server.

  `hostname` — Is the hostname of the TFTP server. (You must enable DNS to use this option. See the *ExtremeWare Software User Guide* for more information.)

  `filename` — Is the filename of the new image.

  `primary` — Indicates the primary image.

  `secondary` — Indicates the secondary image.

The module can store up to two images; a primary and a secondary. When you download a new image, you must select into which image space (primary or secondary) the new image should be placed. If not indicated, the primary image space is used.

You can select which image the switch or module will load on the next reboot by using the following command:

```
use image {slot <slot>} [primary | secondary]
```

2 Configuring the WAN Physical Link

This chapter covers the following topics:

- Configuring WAN Physical Links on page 2-2
- Monitoring WAN Physical Links on page 2-8

Overview

In this document, WAN refers to either T1, E1, or T3 technologies. T1 is a mature technology originally developed for voice telephone transmission. It was used to aggregate a number of voice lines into a single connection to the telephone network. Today, T1 is also used to transmit digital data using widely available equipment and established wiring commonly available in diverse locations.

A similar technology standard is in use in Europe, namely E1. T1 and E1 are similar, but not identical.

Higher bandwidth characterizes T3 connections. Essentially, a T3 connection is equivalent to a bundle of 28 T1 connections.

This chapter describes the T1, E1, and T3 features that can be configured in the WAN module software.

Red, Blue, and Yellow Alarms

WAN links have error detection built into the link hardware. The hardware can detect different types of errors, labeled red, blue and yellow alarms.

A red alarm occurs when the signal is lost or an out of frame error occurs. An out of frame error can be caused when the framing type configured for the local interface does not match the framing type of the incoming signal or when the incoming signal does not contain a framing pattern.

A yellow alarm is also called a Remote Alarm Indication (RAI). When the remote end of a link does not receive a signal, it will transmit a yellow alarm signal back to the local end.

A blue alarm is also called an Alarm Indication Signal (AIS). A blue alarm indicates that a device somewhere upstream has experienced a loss of signal.

Alarms affecting a link can be viewed by using one of the show commands, for example, `show ports t1 alarms`.

Configuring WAN Physical Links

There are a number of parameters that can be configured for a WAN link. If you have control of both sides of the link, then the default configuration is probably the best choice. If you must connect to a line controlled by another organization, you will need to configure the line to correspond with the settings at the other end. Some parameters are only configurable, or only apply to some of the WAN link types. The following list of parameters also displays which types of WAN links allow you to configure that parameter:

- Cable length (T1, T3)
- Clock Source (T1, E1, T3)
- Facility Data Link (T1)
- Framing (T1, E1, T3)
- Inband Loopback Detection (T1)
- Linecoding (T1)
- Receiver Gain (E1)
- SNMP Alerts (T1, E1, T3)

- Timeslots (E1)
- Yellow Alarms (T1)

Cable length

Longer cable lengths cause greater losses for signals, so transmitter hardware must transmit at a higher level to transmit data successfully. However, too high a signal level can cause crosstalk from one cable to another. The cablelength parameter allows you to control the transmitter signal level for your conditions. Typically, your service provider will suggest the correct level.

The parameter values available differ for T1 and T3 links. For E1, the parameter value is not changeable, but is always set to 120 Ohms. However, for E1 links you can configure the receiver gain to meet your conditions. See the section *Receiver Gain* on *page 2-5*.

For short haul connections (less than 1000 feet) the typical equipment uses less sensitive receivers. The transmitter level for T1 is set by selecting a cable length in feet, from the following values: 133, 266, 399, 533 or 655. For T3, select from the following values: 249 or 900. Choose the next higher value if the cable length provided by your service provider does not match one of these values. For example, choose 133 for a 50 foot cable and 533 for a 450 foot cable. The default value is 133, which corresponds to cables in the range of 0-133 feet.

For longer distances (up to 6000 feet) T1 equipment uses more sensitive receivers, and crosstalk is more likely to occur. Under these conditions, the transmitter level is set by selecting a transmitter attenuation level in dB from the following values: -22.5, -15, -7.5, or 0.

From lowest to highest transmitter level, use the following values for the `config port t1 cablelength` command: -22.5 db, -15 db, -7.5 db, 0 db, 133 feet, 266 feet, 399 feet, 533 feet, and 655 feet.

To configure the cable length, use one of the following commands:

```
config ports <portlist> t1 cablelength [0 | -7.5 | -15 | -22.5] db
config ports <portlist> t1 cablelength [133 | 266 | 399 | 533 | 655]
feet
config ports <portlist> t3 cablelength [249 | 900] feet
```

Clock Source

A clock is used to synchronize data transmission on the line. Generally, one end of the link provides the master clock, and the other end of the link recovers the clock from the signal on the line. By default the clock source is derived from the line. If needed, an internal clock is available. To configure the clock source, use the following command:

```
config ports <portlist> [t1 | e1 | t3] clocksource [internal | line]
```

Note: If the clock source is configured as "line", but the clock cannot be recovered from the signal on the line, the hardware will use the internal clock instead.

Facility Data Link

Facility data link (FDL) for T1 links uses twelve bits in the ESF frame to signal information about line and connection status. Since FDL is only meaningful for ESF framing, FDL settings are ignored when a port is configured for SF framing. See "Inband Loopback Detection" for information on configuring framing.

The two T1 standards supported for FDL are ATT, described by the ATT 54016 specification, and ANSI, described by the T1.403 standard. The default value is off. To configure FDL, use the following command:

```
config ports <portlist> t1 fdl [off | att | ansi]
```

Framing

Framing is used to synchronize data transmission on the line. Framing allows the hardware to determine when each packet starts and ends. The two choices for T1 framing are Super Frame (SF), also known as D4, and Extended Super Frame (ESF). The ESF scheme is a newer standard and is enabled by default. To choose the T1 framing scheme, use the following command:

```
config ports <portlist> t1 framing [esf | sf]
```

If you choose to use SF framing, you should disable yellow alarm detection for the T1 line. SF framing may generate false yellow alarms. See "Yellow Alarms" on page 2-6 for more details.

The framing choices for E1 are CRC4 or no-CRC4. To choose the E1 framing scheme, use the following command:

```
config ports <portlist> e1 framing [crc4 | no-crc4]
```

The framing choices for T3 are C-bit and M13. To choose the T3 framing scheme, use the following command:

```
config ports <portlist> t3 framing [c-bit | m13]
```

Inband Loopback Detection

When inband loopback detection is enabled, a specific sequence of data in the signal payload from the remote end of the T1 link will cause the local end to enter network line loopback mode and send any received signal back to the remote end. Inband loopback detection is only possible if the FDL standard is configured as ATT. See “Facility Data Link” on page 2-4 for more details. By default, inband loopback detection is off. See “Loopback” on page 2-8 for more information about loopback modes. To configure inband loopback detection, use the following command:

```
config ports <portlist> t1 lbdetect [off | inband]
```

Linecoding

Linecoding is the convention used to encode signals for transmission over the line.

For T1 connections you can choose from two linecoding standards, bipolar eight zero suppression (B8ZS) or alternate mark inversion (AMI). The default value is B8ZS. To configure linecoding, use the following command:

```
config ports <portlist> t1 linecoding [b8zs | ami]
```

Receiver Gain

The receiver gain for E1 links can be configured to improve performanance of the link. Changing the receiver gain can help to receive the E1 signal or to reduce crosstalk. Receiver gain is only configurable for E1 links. To configure receiver gain, use the following command:

```
config ports <portlist> e1 receivergain [-12 | -43] db
```

SNMP Alerts

If the WAN module hardware detects a red, yellow, or blue alarm, the alarms are displayed by using a show command. Additionally, the module can be configured to

send an SNMP alert to the SMMi in the switch when red, yellow, or blue alarms are detected. If the module is configured to send SNMP alerts, and the switch is configured to send SNMP trap messages, then the switch will send a message to any SNMP trap receivers that have been configured. To configure SNMP trap receivers, and for more information about configuring SNMP in ExtremeWare, see the *ExtremeWare Software User Guide.*

The module can also be configured not to send an SNMP alert to the SMMi. Any red, yellow, or blue alarms will not be reported to the SNMP trap receivers. The default value for SNMP alerts is enabled. To configure whether SNMP alerts are generated from WAN alarms, use the following command:

```
config ports <portlist> [t1 | e1 | t3] snmp alert [enable | disable]
```

Timeslots

The E1 signal is divided into thirty-two timeslots, numbered 0 through 31. The first timeslot (0) is reserved and cannot be used to transmit data. The timeslot numbered 16 is often used for voice phone calls in installations that combine voice and data. For installations that use the full E1 bandwith for data communications, you will not need to configure which timeslots are used. For installations that do not use the total E1 bandwith, your E1 provider will tell you which timeslots to use.

To configure which timeslots to use for your E1 link, use the following command:

```
config ports <portlist> e1 timeslots <timeslots>
```

A timeslot list uses a dash to represent a range of numbers and a comma to separate single numbers or ranges. Valid timeslots range from 1 to 31. For example, to specify timeslots 1 through 15 and 17 through 31 for the E1 port 1 on slot 4, use the following command:

```
config ports 4:1 e1 timeslots 1-15,17-31
```

Yellow Alarms

A yellow alarm occurs on a device when its signal is not received at the remote end. It is also called a Remote Alarm Indication (RAI). You can disable detection and generation of yellow alarms for a T1 port. When SF framing is used, yellow alarm detection and generation should be set to off, because detection of yellow alarms is not reliable when data traffic is transmitted with SF framing (data traffic often contains bit combinations that do not occur for encoded voice traffic). The default value for yellow

alarm generation and detection is both. To configure yellow alarms, use the following command:

```
config ports <portlist> t1 yellow [detection | generation | both | off]
```

WAN Port Configuration Commands

Table 2-1 describes the commands used to configure a WAN port.

Table 2-1: WAN Port Configuration Commands

Command	Description
config ports <portlist> t1 cablelength [[133 | 266 | 399 | 533 | 655] feet | [0 | -7.5 | -15 | -22.5] db]	Specifies the transmitter level for the cablelength attached to the T1 port. The default is 133 feet.
config ports <portlist> t3 cablelength [249 | 900] feet	Specifies the transmitter level for the cablelength attached to the T3 port. The default is 249 feet.
config ports <portlist> [t1 | e1 | t3] clock source [internal | line]	Specifies the clock source used for transmission. The default setting is line.
config ports <portlist> t1 fdl [off | att | ansi]	Specifies the facilities data link (FDL) format for the port. You cannot use FDL with SF framing.
config ports <portlist> t1 framing [esf | sf]	Specifies the framing type. The default setting for T1 is esf, Extended Super Frame (ESF). If sf, Super Frame (SF), is chosen for T1, set yellow alarm detection to off, since a yellow alarm can be incorrectly detected with SF framing.
config ports <portlist> e1 framing [crc4 | no-crc4]	Specifies the framing type. The default setting for E1 is crc4.
config ports <portlist> t3 framing [c-bit | m13]	Specifies the framing type. The default setting for T3 is c-bit.
config ports <portlist> t1 lbdetect [off | inband]	Enables and disables the T1 port to respond to loopback requests from the remote end. The default setting is off.
config ports <portlist> t1 linecode [b8zs | ami]	Sets the linecoding for T1 ports. The default setting is b8zs.
config ports <portlist> e1 receivergain [-12 | -43] db	Specifies the receiver gain level for an E1 link.
config ports <portlist> [t1 | e1 | t3] snmp alert [enable | disable]	Enables and disables SNMP alerts. The default setting is enabled.

Table 2-1: WAN Port Configuration Commands (continued)

Command	Description
config ports <portlist> e1 timeslots <timeslots>	Sets the timeslots for data used on the E1 link. Timeslots range from 1 to 31.
config ports <portlist> t1 yellow [detection | generation | both | off]	Enable and disable yellow alarm detection and generation for T1 ports.

Monitoring WAN Physical Links

T1, E1, and T3 devices have a built-in facility designed for troubleshooting the physical link, called loopback. The link can also be monitored using show commands to display the current configuration of the link, any alarms on the link, link statistics, and link errors.

Loopback

The WAN device can be set up to loopback, that is, return a transmitted signal back to the sender so it can be compared with the original. There are several different types of loopback available to test different parts of the device and the line, as specified in the T1, E1, and T3 standards.

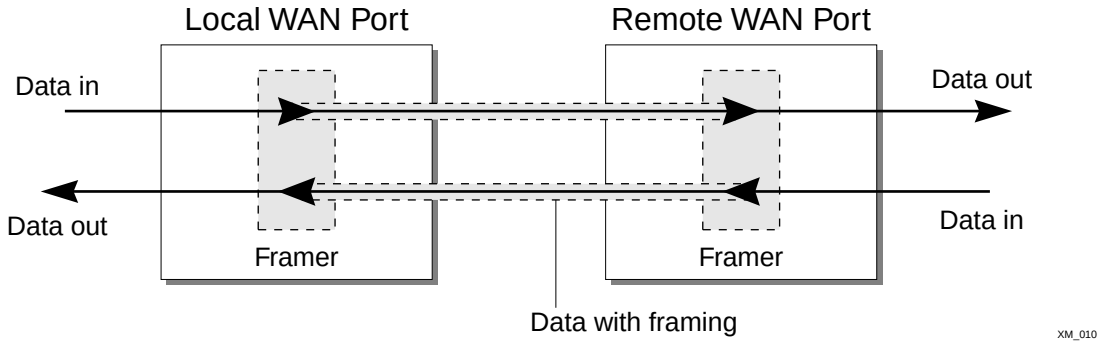


Figure 2-1: Normal operation of WAN link

During normal operation of a link, as the local data stream enters the framer, the appropriate framing bits are inserted into the data, and the framed signal is transmitted

to the remote end. At the remote end, the process is reversed as the framing bits are discarded and the data stream is passed to the remote system.

Loopback can be enabled on the near-end of a WAN link, but only the T1 and T3 modules can enable loopback on the far-end of a link. The near-end loopback modes are controlled directly by the hardware on the near-end. Far-end loopback modes require the cooperation of the far-end hardware. A message is sent to the far-end to cause it to enter a far-end loopback mode. When loopback is enabled on a WAN port, the green port LED will blink.

Near-end Loopback Modes

The near-end of T1 links can be enabled for the following three loopback modes:

- Local
- Network Line
- Network Payload

The near-end of E1 and T3 links can be enabled for the following two loopback modes:

- Local
- Network Line

The local loopback mode reflects the data stream internally to the near-end. The network line loopback mode reflects the signal to the far-end. The network payload mode reflects the data carried in the signal and regenerates framing information back to the far-end.

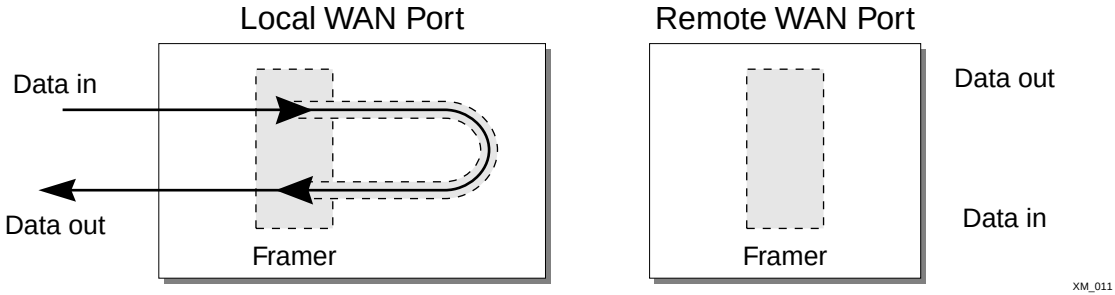


Figure 2-2: Local loopback mode

Local Loopback Mode. When the local port is enabled for local loopback, the local data stream goes into the framer and the framing bits are inserted into the data, but the data is not transmitted to the remote end. Instead, it is sent back through the local framer, the framing bits are discarded, and the original data is returned. This mode tests the local end.

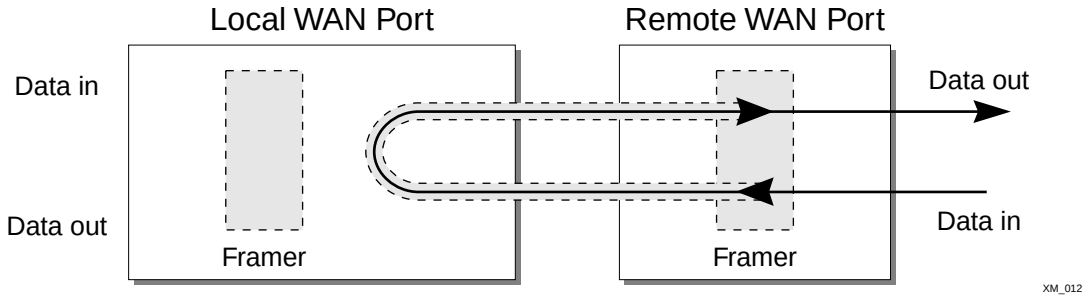


Figure 2-3: Network line loopback mode

Network Line Loopback Mode. When the local port is enabled for network line loopback mode, the received signal is sent back to the remote end without reframing the data. This mode primarily tests the integrity of the line from the remote side.

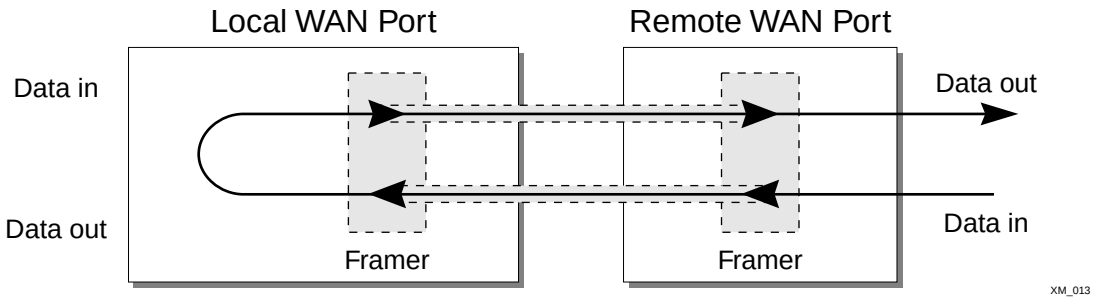


Figure 2-4: Network payload loopback mode

Network Payload Loopback Mode. When the local port is enabled for network payload mode, the framer removes the framing bits from the received signal and recovers the transmitted data. This same data is then reframed and transmitted back to the remote end. This mode tests the line and the local circuitry from the remote side.

Far-End Loopback Modes

The far-end of T1 links can be enabled for the following two loopback modes:

- Remote Line
- Remote Payload

The far-end of T3 links can be enabled for the following loopback mode:

- Remote Line

The remote line mode reflects the received signal back to the near-end. The remote payload mode reflects the data and regenerates the framing information back to the near-end.

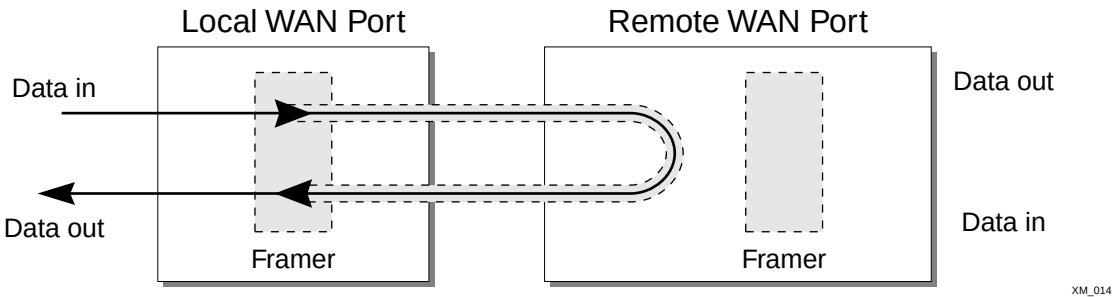


Figure 2-5: Remote line loopback mode

Remote Line Loopback Mode. When the local port is enabled for remote line loopback mode, it sends a request to the remote end to enter the equivalent of network line loopback mode. The signal transmitted to the remote end will be retransmitted as received back to the local end.

Note: If the T1 line is configured to use the ATT FDL standard, the remote end must be configured to detect inband loopback requests for the remote end to enter remote line loopback mode.

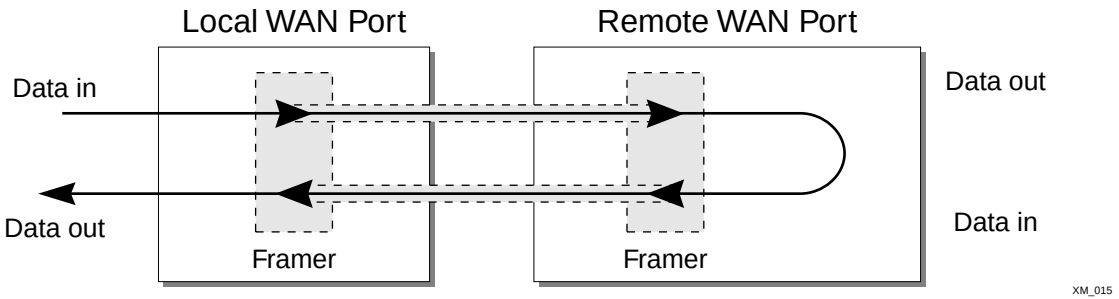


Figure 2-6: Remote payload loopback mode

Remote Payload Loopback Mode. When the local port is enabled for remote payload loopback mode, it sends a request to the remote end to enter the equivalent of network payload loopback mode. When the remote end enters loopback mode, the framer at the remote end removes the framing bits from the received signal and recovers the transmitted data. This same data is then reframed and transmitted back to the local end.

Enabling Loopback Mode

To enable a local loopback mode, use one of the following commands:

```
enable ports <portlist> [t1 | e1 |t3] loopback [local | network line]
enable ports <portlist> t1 loopback network payload
```

To enable a remote loopback mode, use one of the following commands:

```
enable ports <portlist> t1 loopback remote [line | payload]
enable ports <portlist> t3 loopback remote line
```

Disabling Loopback Mode

Use the following command to return the near and remote side of a T1, E1 or T3 link from loopback mode to normal mode:

```
disable ports <portlist> [t1 | e1 | t3] loopback
```

You can also use the following command to return the remote T1 or T3 port to normal function from loopback mode:

```
enable ports <portlist> [t1 | t3] loopback remote loopdown
```

WAN Port Monitoring Commands

Table 2-2 describes the commands used to monitor a WAN port.

Table 2-2: WAN Port Monitoring Commands

Command	Description
disable ports <portlist> [t1 | e1 | t3] loopback	Disables the current loopback mode and return to normal function.
enable ports <portlist> [t1 | e1 | t3] loopback [local | network line] enable ports <portlist> t1 loopback network payload	Enables the near-end port loopback modes.
enable ports <portlist> [t1 | t3} loopback remote [line | payload | loopdown]	Enables the far-end T1 or T3 port loopback modes and stops the loopback
show ports {<portlist>} {t1 | e1 | t3} stats	Displays real-time port statistics.
show ports {<portlist>} [t1 | e1 | t3] alarms	Displays real-time port alarms.
show ports {<portlist>} [t1 | e1 | t3] configuration	Displays the port configuration and status.
show ports {<portlist>} [t1 | t3] errors [near-end | far-end] [totals | intervals | current] show ports {<portlist>} e1 errors near-end [totals | intervals | current]	Displays current and past errors.
show ports {<portlist>} [t1 | e1 | t3] info	Displays the port configuration and status.

3 Configuring PPP and MLPPP

This chapter covers the following topics:

- Multilink PPP and Multilink Groups on page 3-2
- Configuring a PPP/MLPPP Link on page 3-3
- Monitoring PPP/MLPPP Links on page 3-6
- PPP/MLPPP Configuration Examples on page 3-7

Overview

Point-to-Point Protocol (PPP) is used across the entire range of communication speeds and devices found on the internet. Typically, PPP uses Layer 3 to connect two broadcast networks, say two ethernet LANs, into a single WAN by transporting IP packets over a link. PPP can also use Layer 2 to bridge VLAN traffic.

Multilink PPP (MLPPP) is a protocol for combining a number of PPP links into one bundle that transports traffic over the links in the bundle. Multilink PPP is supported for T1 and E1 technologies in ExtremeWare, but not for T3. Instead, a T3 link is configured as a single PPP link.

A multilink group is a bundle of individual PPP links that are configured to work together as a single link. With a multilink group configured, it is easy to add or remove PPP links in order to provide appropriate bandwidth. The multilink group balances traffic among the individual PPP links and properly sequences packets across the multilink group.

Typically, you would create a multilink group, configure the multilink group by adding T1 or E1 ports and configuring PPP/MLPPP parameters, add the multilink group to a VLAN, and finally, enable the multilink group.

For a T3 port, you would configure its PPP parameters and add it to a VLAN.

Multilink PPP and Multilink Groups

Each multilink PPP group is given a name, up to 16 characters in length. All named components of the switch configuration must have unique names, so multilink groups and VLANs cannot have identical names. See the *ExtremeWare Software User Guide* for more information on allowable names for named components. Components are named using the `create` command. Once a component is named, you do not need to use the keyword for the component (see the shortcut below).

Create the multilink group using the following command:

```
create multilink <groupname>
```

Once the multilink group is created, assign ports to it. All T1/E1 ports must be added as tagged ports. If the ports are configured as IPCP ports, then the tags will be stripped as traffic passes over the link. BCP-configured ports will pass the tag across the link. See the section “Encapsulation” for more information. Add ports by using the following command:

```
config multilink <groupname> add ports <portlist> tag
```

or you can use the following shortcut:

```
config <groupname> add ports <portlist> tag
```

If the first port added to a multilink group is already configured for PPP, the multilink group will inherit the configuration of the first port. Any other ports added to the link will be configured to match the multilink configuration. The next section lists the configuration commands for multilink groups and single PPP links.

Once the multilink group has been configured, it is added to a VLAN so that it can pass traffic from the VLAN across the link. To add a multilink group to a VLAN, use the following command:

```
config vlan <vlan> add multilink <groupname>
```

Typically the last step in configuring a multilink group is to use the following command to enable it:

```
enable multilink <groupname>
```

Any changes to an enabled multilink group will not take effect until the multilink group is restarted. To restart a multilink group, use the following command:

```
restart multilink <groupname>
```

Configuring a PPP/MLPPP Link

All of the PPP configuration commands can be used to configure a single port or to configure a multilink group, so the following sections for PPP links also apply to MLPPP links. To configure a PPP / MLPPP link you will need to choose the authentication and encapsulation for the link.

If you change the configuration of an enabled PPP or MLPPP link, the changes will not take effect until the link is restarted. To restart a PPP link, use the following command:

```
restart ports <portlist>
```

To restart an MLPPP link, use the following command:

```
restart multilink <groupname>
```

Authentication

By default, no authentication is configured on PPP links since the WM-4T1i module will typically be used with leased lines—where both sides of the link are controlled and authentification is not required. If authentication is needed, the WM-4T1i module supports either PAP or CHAP. Password authentication protocol (PAP) authenticates a user as the connection is established by sending a username and password. Challenge Handshake Authentication Protocol (CHAP) authenticates a user by sending a challenge across the link. The remote end calculates a response based on the user password and sends the response back across the link. CHAP is a more secure authentication protocol than PAP. The link can also be configured to attempt to use CHAP first, followed by PAP, if CHAP fails.

To configure authentication on a PPP link, use the following command:

```
config ppp authentication [off | chap | pap | chap-pap] [ports
<portlist> | multilink <groupname>]
```

PPP Link Username

When the local end of a link initiates a PPP connection, the local end must send the appropriate authentication information. For PAP it sends the username and password, for CHAP it sends the username and must respond correctly to the challenge, and for no authentication it sends nothing. To configure the username and password used to initiate the link, use the following command:

```
config ppp user <username> {encrypted} <password> [ports <portlist> |
multilink <groupname>]
```

The encrypted keyword is used to hide the password when the switch configuration is displayed; it does not control whether the password is encrypted across the link during authentication.

PPP User Accounts

When the remote end initiates the link, the local end must verify the authentication information. The local end maintains a list of authorized user accounts and passwords. To add a user to the list, use the following command:

```
create account pppuser <name> {encrypted} {<password>}
```

Encapsulation

The packets passed over the PPP/MLPPP link can use either bridged or routed encapsulation. You would use bridged packets if you plan to have VLANs span the link. You would use routed packets if the link connects two different routed networks or separate VLANs.

Using bridged packets allows the VLAN tags to be carried across the PPP/MLPPP link. Bridged packets are transported using the PPP Bridging Control Protocol (BCP), described in RFC 2878. When the encapsulation is set to BCP, 802.1Q and 802.1p information is preserved and transported across the link. On a WAN module, a VLAN may only contain one BCP encapsulated link, but you may have multiple VLANs span the link.

Routed packets are transported across a PPP/MLPPP link using IP Control Protocol (IPCP), described in RFC 1332. This is the encapsulation that is familiar to most users of PPP. The routed packets do not contain Ethernet headers so cannot preserve VLAN tags. However, the WAN ports still must be added as tagged ports to the VLAN that contains them. The module uses the tags internally and strips them off before the packets are transmitted. The IP addresses used for the PPP/MLPPP link are taken from the IP address assigned to the VLAN at each end of the link. The VLAN that contains the IPCP encapsulated PPP/MLPPP ports cannot contain other ports. In other words, the only ports allowed in the VLAN are those that make up the IPCP encapsulated link.There can only be one VLAN spanning an IPCP-encapsulated link.

You must have one and only one encapsulation type configured on a PPP/MLPPP link. Setting BCP encapsulation off implies that IPCP encapsulation is on. The default setting is BCP encapsulation on and IPCP encapsulation off. To configure encapsulation, use the following command:

```
config ppp [bcp [on | off] | ipcp [on | off]] [ports <portlist> |
multilink <groupname>]
```

PPP/MLPPP Configuration Commands

Table 3-1 describes the commands used to configure a PPP/MLPPP link.

Table 3-1: PPP/MLPPP Configuration Commands

Command	Description
config multilink <groupname> add ports <portlist>	Adds ports to a multilink group.
config multilink <groupname> delete ports <portlist>	Removes ports from a multilink group.
config ppp authentication [off | chap | pap | chap-pap] [ports <portlist> | multilink <groupname>]	Sets the authentication method for a PPP link or a MLPPP multilink group. The default setting is to use no authentication.
config ppp [bcp [on | off] | [ipcp [on | off]] [ports <portlist> | multilink <groupname>]	Sets the encapsulation method for a PPP/MLPPP link. You cannot set both to on, or both to off. Configuring bcp on implies ipcp off; configuring ipcp on implies bcp off. The default setting is bcp on.
config ppp user <username> {encrypted} <password> [ports <portlist> | multilink <groupname>]	Sets the username sent to the remote end of a PPP/MLPPP link for authentication.

Table 3-1: PPP/MLPPP Configuration Commands (continued)

Command	Description
config vlan <vlan> add multilink <groupname>	Adds an MLPPP multilink group to a VLAN.
config vlan <vlan> delete multilink <groupname>	Removes an MLPPP multilink group from a VLAN.
create account pppuser <name> {encrypted} {<password>}	Adds a username that will be accepted by the local end during authentication.
create multilink <groupname>	Creates a multilink group.
delete multilink <groupname>	Deletes a multilink group.
delete account pppuser <username>	Removes a username from the local authentication list.
disable multilink <groupname>	Disables a multilink group.
enable multilink <groupname>	Enables a multilink group (and enables all ports in the group).
restart multilink <groupname>	Restarts multilink group. Configuration changes made to an enable multilink group will not take effect until the group is restarted.
unconfig ppp port <portlist>	Resets the port to the default PPP configuration, no authentication and BCP encapsulation.

Monitoring PPP/MLPPP Links

The following commands monitor the status of the PPP and MLPPP links.

Table 3-2: PPP/MLPPP Show Commands

Command	Description
show multilink <groupname>	Displays the configuration of the multilink group.
show multilink [<groupname>] stats {detail}	Displays multlink group statistics.
show multilink [<groupname>] [t1 | e1] alarms {detail}	Displays T1/E1 alarm status for multilink groups.[1]
show multilink [<groupname>] t1 errors [near-end | far-end] [totals | intervals | current]	Displays T1 error statistics for a multilink group.[2]
show multilink [<groupname>] e1 errors near-end [totals | intervals | current]	Displays E1 error statistics for a multilink group.

Table 3-2: PPP/MLPPP Show Commands (continued)

Command	Description
show ppp {<portlist>} {detail}	Shows PPP configurations.
show accounts pppuser	Show the PPP accounts on the switch.

1. To display alarm status for T3 links, use the `show ports t3 alarms` command
2. To display error statistics for T3 links, use the `show ports t3 errors` command

PPP/MLPPP Configuration Examples

The following examples show how to configure multilink groups.

Configuring a Bridged PPP/MLPPP Link Example

The following example shows how to configure a BCP-encapsulated multilink group. BCP is the default encapsulation, so it is not explicitly included in this example. While only one VLAN is shown in this example, you may configure multiple VLANs across the link. The `config ports t1 clocksource` command is included to show where you might need to configure the T1 parameters for your link. Each T1 port in the multilink group will have the same T1 and PPP configurations. If you change the configuration for a single port, the change will affect the entire group.

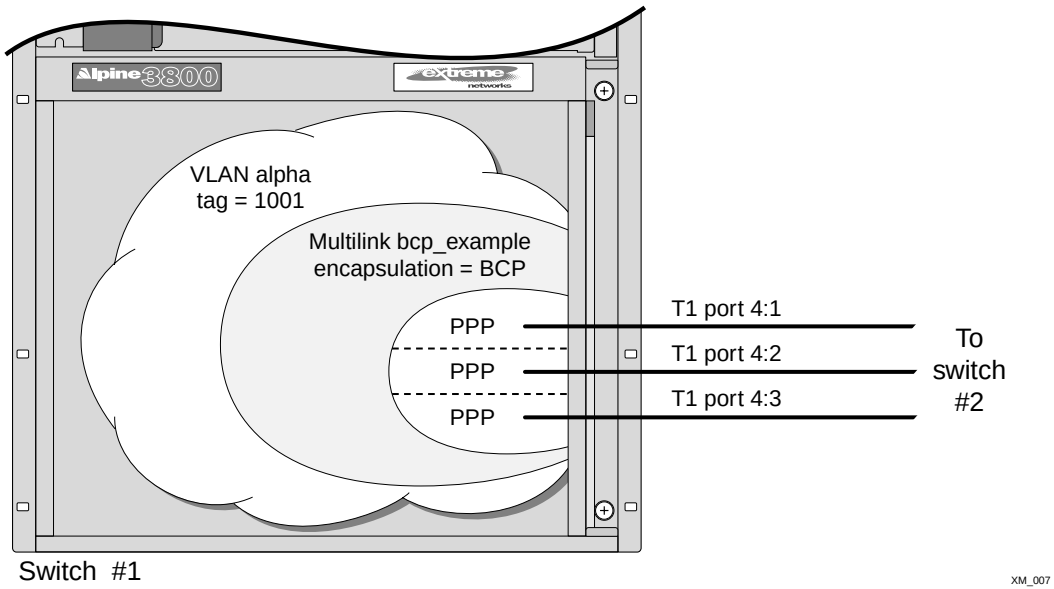


Figure 3-1: BCP multilink example

```
create vlan alpha
config alpha tag 1001
create multilink bcp_example
config ports 4:1-4:3 t1 clocksource internal
config bcp_example add ports 4:1-4:3 tag
config alpha add multilink bcp_example
enable bcp_example
```

Configuring a Routed PPP/MLPPP Link Example

The following example shows how to configure a IPCP-encapsulated multilink group. The VLAN that contains the IPCP-encapsulated multilink group cannot contain any other ports, and only one VLAN is allowed across the link. Notice that the T1 ports must be added as tagged ports even though the tag will be removed before the packet is transmitted over this link.

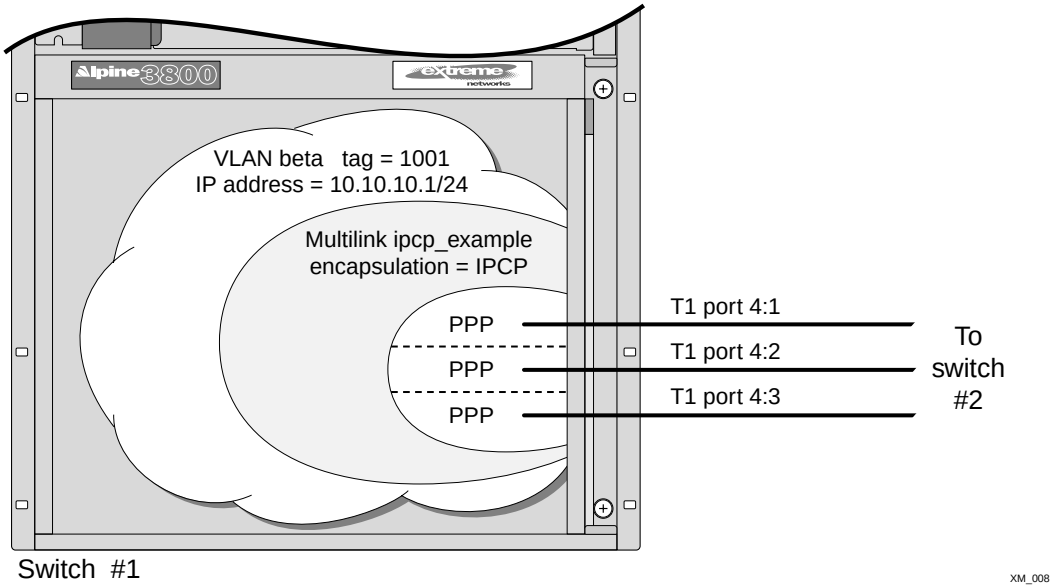


Figure 3-2: IPCP multilink example

```
create vlan beta
config beta tag 1001
config beta ipaddress 10.10.10.1/24
create multilink ipcp_example
config ipcp_example add ports 4:1-4:3 tag
config ppp ipcp on ports 4:1-4:3
config beta add multilink ipcp_example
enable ipcp_example
```

A Safety Information

Industry Canada Certification

The Industry Canada label identifies certified equipment. This certification means that the equipment meets the telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements documents. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that the compliance with the above conditions might not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

FCC Certification

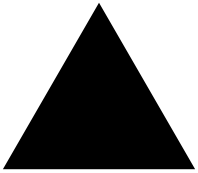
This equipment complies with Part 68 of the FFC rules. On the printed circuit board of this equipment is a label that contains, among other information, the FCC registration number for this equipment. If requested, provide this information to your telephone company.

If your WM-4T1i module causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

If you experience trouble with this WM-4T1i module, please contact Extreme Networks at 3585 Monroe Street, Santa Clara, CA, 95051, for repair/warranty information. The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected or you are sure that the equipment is not malfunctioning.

There are no repairs that can be made by the customer to the WM-4T1i.



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